

as to think all those things the productions of chance? Certainly, either their Ratiocination must be extremely depraved, or they did never attentively consider and contemplate the Works of the Al-mighty.

Observ. XXXVIII. *Of the Structure and motion of the Wings of Flies.*

**T**He Wings of all kinds of Insects, are, for the most part, very beautifull Objects, and afford no less pleasing an Object to the mind to speculate upon, then to the eye to behold. This of the blue Fly, among the rest, wants not its peculiar ornaments and contrivances; it grows out of the *Thorax*, or middle part of the body of a Fly, and is seated a little beyond the center of gravity in the body towards the head, but that *Excentricly* is curiously balanc'd; first, by the expanded *Area* of the wings which lies all more backwards then the root, by the motion of them, whereby the center of their vibration is much more backwards towards the tail of the Fly then the root of the wing is. What the vibrative motion of the wings is, and after what manner they are moved, I have endeavour'd by many trials to find out: And for the first manner of their motion, I endeavour'd to observe several of those kind of small spinning Flies, which will naturally suspend themselves, as it were, pois'd and steady in one place of the air, without rising or falling, or moving forwards or backwards; for by looking down on those, I could by a kind of faint shadow, perceive the utmost extremes of the vibrative motion of their wings, which shadow, whilst they so endeavour'd to suspend themselves, was not very long, but when they endeavour'd to flie forwards, it was somewhat longer; next, I tried, it, by fixing the leggs of a Fly upon the top of the stalk of a feather, with Glew, Wax, &c. and then making it endeavour to flie away; for being thereby able to view it in any posture, I collected that the motion of the wing was after this manner. The extreme limits of the vibrations were usually somewhat about the length of the body distant from one another, oftentimes shorter, and sometimes also longer; that the foremost limit was usually a little above the back, and the hinder somewhat beneath the belly; between which two limits, if one may guess by the sound, the wing seem'd to be mov'd forwards and backwards with an equal velocity: And if one may (from the shadow or faint representation the wings afforded, and from the consideration of the nature of the thing) guess at the posture or manner of the wings moving between them, it seem'd to be this: The wing being suppos'd placed in the upmost limit, seems to be put so that the plain of it lies almost *horizontal*, but onely the forepart does dip a little, or is somewhat more deprest; in this position is the wing vibrated or mov'd to the lower limit, being almost arrived at the lower limit, the hinder part of the wing moving somewhat faster then the former,

former, the *Area* of the wing begins to dip behind, and in that posture seems it to be mov'd to the upper limit back again, and thence back again in the first posture, the former part of the *Area* dipping again, as it is moved downwards by means of the quicker motion of the main stem which terminates or edges the forepart of the wing. And these vibrations or motions to and fro between the two limits seem so swift, that 'tis very probable (from the sound it affords, if it be compar'd with the vibration of a musical string, tun'd unison to it) it makes many hundreds, if not some thousands of vibrations in a second minute of time. And, if we may be allow'd to guess by the sound, the wing of a Bee is yet more swift, for the tone is much more acute, and that, in all likelihood, proceeds from the exceeding swift beating of the air by the small wing. And it seems the more likely too, because the wing of a Bee is less in proportion to its body, then the other wing to the body of a Fly; so that for ought I know, it may be one of the quickest vibrating *spontaneous* motions of any in the world; and though perhaps there may be many Flies in other places that afford a yet more shrill noise with their wings, yet 'tis most probable that the quickest vibrating *spontaneous* motion is to be found in the wing of some creature. Now, if we consider the exceeding quickness of these Animal spirits that must cause these motions, we cannot chuse but admire the exceeding vividness of the governing faculty or *Anima* of the Insect, which is able to dispose and regulate so the the motive faculties, as to cause every peculiar organ, not onely to move or act so quick, but to do it also so regularly.

Whilst I was examining and considering the curious *Mechanism* of the wings, I observ'd that under the wings of most kind of Flies, Bees, &c. there were plac'd certain *pendulums* or extended drops (as I may so call them from their resembling motion and figure) for they much resembled a long hanging drop of some transparent viscous liquor; and I observed them constantly to move just before the wings of the Fly began to move, so that at the first sight I could not but guess, that there was some excellent use, as to the regulation of the motion of the wing, and did phancy, that it might be something like the handle of a Cock, which by vibrating to and fro, might, as 'twere, open and shut the Cock, and thereby give a passage to the determinate influences into the Muscles; afterwards, upon some other trials, I suppos'd that they might be for some use in respiration, which for many reasons I suppose those Animals to use, and, methought, it was not very improbable, but that they might have convenient passages under the wings for the emitting, at least, of the air, if not admitting, as in the gills of Fishes is most evident; or, perhaps, this *Pendulum* might be somewhat like the staff to a Pump, whereby these creatures might exercise their *Analogous* lungs, and not only draw in, but force out, the air they live by: but these were but conjectures, and upon further examination seem'd less probable.

The fabrick of the wing, as it appears through a moderately magnifying *Microscope*, seems to be a body consisting of two parts, as is visible in the 4. Figure of the 23. Scheme; and by the 2. Figure of the 26. Scheme; the one is a quilly